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| 10/552,103 | 07/27/2006 | Werner Kiefer | 2133.113USU | 4119 |

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OHLANDT, GREELEY, RUGGIERO & PERLE, LLP
ONE LANDMARK SQUARE, 10TH FLOOR
STAMFORD, CT 06901

| EXAMINER | |
|---|---|
| DEHGHAN, QUEENIE S | |
| ART UNIT | PAPER NUMBER |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/552,103 | KIEFER ET AL. | |
| | Examiner | Art Unit | |
| | QUEENIE DEHGHAN | 1741 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *04 April 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-10,12-29,32,33,50 and 51* is/are pending in the application.

4a) Of the above claim(s) *20,22-24,27 and 33* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10, 12-19, 21, 25-26, 28-29, 32, 50-51* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 4, 2011 has been entered.

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 50 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 50 recites a $T_{eff}$ at which an energy demand per unit weight of the finished molten material. The specification fails to offer support for a $T_{eff}$ based on the energy needed for the "finished molten material". In fact, the energy needed for the material that is already melted, but just needs to be kept heated to stay molten is very different than the energy needed to actually perform the melting.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-6, 8, 18-19, 25, 29, 32, and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zumbrunnen (4,133,969). Zumbrunnen discloses a method for melting inorganic materials comprising introducing the inorganic materials into melting crucible with cooled walls for producing a skull layer of the melt on the cooled walls (col. 3 lines 30-33, 39-46). Zumbrunnen teaches controlling the skull crucible so that the temperature of the melt is at an effective temperature, wherein the energy required is minimized and thereby providing the most efficient energy utilization (col. 9 line 66 to col. 10 line 19). Since the melt temperature is controlled so as to operate with minimal energy consumption, this temperature is essentially $T_{eff}$, and so, in order to control the

temperature to a $T_{eff}$, the temperature clearly had to have been selected and clearly this is the temperature at which the materials are melted. Zumbrunnen also teaches determining the removal of the melt and the addition of inorganic material based on the energy supplied (col. 12 lines 11-16, col. 4 lines 45-54). In other words, Zumbrunnen selects the throughput to maintain a desired melt level. Additionally, the overall energy balance is based on the this constant quantity of melt/inorganic materials. Therefore, in controlling the melt temperature, the unit weight of the inorganic materials has been taken into consideration, as the overall energy balance relies on the constant melt level maintained. Although residence time is not specifically mentioned, one skilled in the art would understand that the energy supplied to the melting of the inorganic materials is linked to the residence time required for melting the materials (a melt-down time), especially since the goal is to obtain a melt without unnecessarily wasting energy. To obtain a melt, the necessary residence time for the organic materials to be melted must be provided. Therefore, in setting the energy supplied and maintaining a desired melt level, the residence time is also selected and taken into consideration. It would have been obvious to one of ordinary skill in the art at the time of the invention to have expected Zumbrunnen to have adapted the throughput to a required residence time, since the final goal is to achieve a melt, which Zumbrunnen does and further teaches the importance of maintaining a melt level within the crucible.

6. Regarding claims 2-4 and 29, Zumbrunnen teaches closely controlling melt temperature and the heat transfer through the skull to minimize the energy required to operate the apparatus and providing for most efficient energy utilization. Claims 2-4

and 29 recite mathematical formulas that the energy needed to heat the inorganic material is based on commonly known variables, such as the heat capacity of the melt, volume of the melt, density of the melt and residence time for the melt. These variables merely define the minimal energy require to achieve a melt in the skull crucible. Putting in any more energy than what is needed to satisfy the bare minimal heating requirement would simply be energy lost to the environment. Therefore, it would have been obvious to one of ordinary skill in the art to expect the equations of claims 2-4 and the limitation of claim 29 to naturally be satisfied since minimizing energy consumption is recognized as a goal of Zumbrunnen. As mentioned above, Zumbrunnen teaches controlling the melting unit so that the temperature of the melt is at effective temperature at which energy consumption is at a minimum.

7. Regarding claims 5 and 25, Zumbrunnen discloses feeding thermal energy directly to the melt by direct inductive heating (abstract, col. 2 lines 59-65).

8. Regarding claims 6 and 8, Zumbrunnen teaches additionally mixing the melt by generating a convective flow in the melt (col. 11 lines 52-58).

9. Regarding claim 18, Zumbrunnen discloses continuous feeding and removing of the inorganic materials to and from the melt (col. 11 lines 65-68).

10. Claims 6-7, 10-12, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zumbrunnen as applied to claim 1 above, in view of Gagel et al. (5, 738,811). Regarding claims 6-7, Zumbrunnen does not mention a bubbler. Gagel teaches a process for melting inorganic materials in a skull crucible comprising of additionally mixing the melt by agitating the melt with bubbling so as to reduce

temperature and composition variation within the melt (col. 3 lines 12-28, figure 3). It would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the bubbling action of the Gagel in the process of Zumbrunnen in order promote uniform temperature and composition in the melt further.

11. Regarding claims 10-12, Zumbrunnen teaches supplying the inorganic materials into the melt (col. 11 lines 66-68). Zumbrunnen also teaches the melt can be poured from the skull for casting (col. 12 lines 1-5), which implies a batch process. Gagel teaches a similar process of charging the crucible with a batch of inorganic material in powder form, which is considered small pellets, pouring out the batch and repeating by adding more inorganic materials to the surface of the melt (col. 7 lines 44-50, col. 8 lines 52-61). It would have been obvious to one of ordinary skill in the art at the time of the invention to have expected the suggested batch process of Zumbrunnen to comprise of similar steps of adding inorganic materials in the form of a batch and placing the material onto the surface of the melt, as it is a well known process for producing a molten batch for casting purposes, as suggested by Gagel.

12. Regarding claim 26, Zumbrunnen teaches feeding thermal energy directly to the melt, but does not specify direct conductive heating. Gagel teaches a well known method for heating a melt by utilizing electrodes which provide for direct conductive heating (col. 1 lines 25-30). It would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized direct conductive heating as an alternative to the thermal heating of Zumbrunnen as a known means for successfully heating and melting the inorganic materials of Zumbrunnen.

13. Claims 13-14 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zumbrunnen as applied to claim 1 above, and further in view of Rodek et al. (WO 0216274 as represented by 7,694,533). Zumbrunnen does not discuss a refining step. Rodek teaches a refining is a necessary step after melting in order to remove residual bubbles from the melt, wherein refining can be performed by adding a refining agent (col. 1 lines 11-15). Rodek also discloses introducing the melt/inorganic material into the crucible from one side of the crucible at a melt bath surface and discharging the melt on an opposite side at the melt batch surface (fig. 1, claim 1). Such a flow pattern allows for less wear and tear on a connecting channel between the melting crucible and refining crucible. It would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the flow pattern in the melting crucible as Rodek and a refining step in the process of Zumbrunnen in order to assist in the removal of residual bubbles for the production of a high quality inorganic product, while minimizing wear and tear on the apparatus.

14. Regarding claim 14, Zumbrunnen teaches producing a convective flow in the melt (col. 11 lines 52-58).

15. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zumbrunnen, as applied to claim 25 above, in view of Gagel et al. (.

16. Claims 8-9, 14-15, 21, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zumbrunnen, as applied to claims 6 and 19 above, and Rodek, as applied to claim 13 above, in future view of Romer et al. (WO 01/14266 as represented by 7,137,277). Regarding claims 8-9 and 14-15, Zumbrunnen does not disclose a

specific temperature difference in the melt for producing a convective flow. Romer teaches a similar process of melting inorganic materials and refining the melt, wherein a convective flow is produced by setting a viscosity of less than $10^2$ dPas and a melt temperature difference between an inner region of the melt and an outer region of the melt of greater than 250 K (col. 1 lines 52-67, col. 2 lines 1-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to have employed the set the viscosity to less than $10^2$ dPas and the temperature difference in the skull crucible greater than 250K in the process of Zumbrunnen in order to allow for more effective thorough mixing of the melt, as suggested by Romer.

17. Regarding claim 21, as mentioned above, Zumbrunnen teaches selecting a $T_{eff}$, but does not disclose a specific viscosity or temperature different of the melt. Romer teaches a similar process of melting inorganic material and refining the melt. Romer further teaches thorough mixing of the melt can be achieved with an optimal viscosity of less than $10^3$ dPas. Romer also teaches a temperature difference in the melt between an inner region of the melt and an outer region of the melt of greater than 150K allows for stronger and more effective thorough mixing as well (col. 1 line 52 to col. 2 line 10). It would have been obvious to one of ordinary skill in the art at the time of the invention to taken into consideration the optimal viscosity of the melt and temperature difference in the melt for convective mixing of the melt when determining the $T_{eff}$ temperature of the Zumbrunnen, in order to provide for optimal conditions for the thorough mixing of the melt within a skull crucible, while minimizing energy consumption.

18. Regarding claim 28, Romer further teaches the optimal viscosity for thorough mixing of the melt can be achieved by providing for temperatures of over 1700°C, especially for some high melting point inorganic materials (col. 2 lines 1-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized a temperature of over 1700°C in the process of Zumbrunnen so as to provide for the optimal viscosity for thorough mixing of the melt.

***Response to Arguments***

19. Applicant's arguments filed April 4, 2011 have been fully considered but they are not persuasive. The applicant argues there is a difference between the temperature dependence of Zumbrunnen's energy minimizing efforts and the temperature dependence as recited in the claims. The Applicant argues this difference occurs because the applicant alleges Zumbrunnen does not account for the required residence time of the melt. The Examiner disagrees. Zumbrunnen teaches an overall heat balance that takes into account the heat losses through the crucible and the heat needed to perform the melting. Clearly, one skilled in the art would understand that to account for the heat required for the melting would include the quantity of materials to be melted (i.e. per unit weight), the temperature at which melting is occurring, and the time takes to perform the melting, so as to actually provide for complete melting. Alleging that Zumbrunnen's method does not account for the residence time would be contradicting the intentions of Zumbrunnen's process. That is, providing for melt heat that does not take into account the residence time would result in scenarios such as unmelted materials, which deviates from the intention of achieving a melt, and such as

providing too much heat resulting in excess heat waste, which also deviates from the intentions of Zumbrunnen to minimize heat consumption.

20. The Applicant also argues Zumbrunnen does not select a temperature as recited in the claims. As discussed above, because Zumbrunnen teaches controlling the melt temperature with the intended goal of minimizing energy consumption and a melt is actually achieved, then naturally, the temperature employed to achieve these two goals is obviously selected.

21. The Applicant adds that it is not the aim of the claimed invention to keep the overall energy consumption as low as possible. The claimed invention recites selecting a temperature for melting materials at which energy consumption is at a minimum (claims 1 and 50) and that this $T_{eff}$ is based on the energy loss and the useful energy used for the actual melting (claim 2). Zumbrunnen also teaches minimizing energy consumption, based on the quantity of the melt in the crucible, by operating at a temperature of the melt at which the minimizing can occur. Zumbrunnen teaches this minimizing depends on the melt heat (useful energy) and the energy loss through the crucible. Zumbrunnen clearly teaches very similar method steps as the claimed invention.

## ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to QUEENIE DEHGHAN whose telephone number is (571)272-8209. The examiner can normally be reached on Monday through Friday 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Daniels can be reached on 571-272-2450. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Queenie Dehghan/
Examiner, Art Unit 1741